

Atty. Docket No.: CA1468  
**PATENT APPLICATION**

AMENDMENT UNDER 37 C.F.R. § 1.111  
U.S. Application No.: 10/033,646

**AMENDMENTS TO THE CLAIMS**

**This listing of claims will replace all prior versions and listings of claims in the application:**

**LISTING OF CLAIMS:**

1. *(Currently Amended)* A method for making a remote copy between a first storage subsystem and a second storage subsystem which are connected to each other via a path, the first storage system connected to a first host, the method comprising the steps of:

providing a first logical volume to the first storage subsystem and a second logical volume to the second storage subsystem, the second logical volume being a copied logical volume of the first logical volume, the first logical volume and the second logical volume being in sync state;

making a third logical volume in the first storage subsystem and copying first data from the first logical volume to the third logical volume, the third logical volume being a copied logical volume of the first logical volume, the first logical volume and the third logical volume being in sync state;

making a fourth logical volume in the second storage subsystem and copying second data from the second logical volume to the fourth logical volume, the fourth logical volume being a copied logical volume of the second logical volume, the second logical volume and the fourth logical volume being in sync state;

breaking the sync state between the first logical volume and the third logical volume and between the second logical volume and the fourth logical volume based on a command;

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after the copying of the first data from the first logical volume to the third logical volume  
and after copying of the second data from the second logical volume to the fourth logical  
volume, establishing a synchronization link between the fourth logical volume and the third  
logical volume;

coupling a first auxiliary host to the third logical volume; and

enabling the first auxiliary host to perform operations on the third logical volume while  
the first host continues operations on the first logical volume and while the first logical volume  
and second logical volume continue in sync state.

2. *(Previously Presented)* The method of claim 1, further comprising:  
providing a second auxiliary host at the second storage subsystem, the second auxiliary  
host having permissions to access the fourth logical volume; and  
executing applications using the first auxiliary host, the second auxiliary host, the third  
logical volume and the fourth logical volume.

3. *(Previously Presented)* The method of claim 2, wherein  
executing applications comprises performing data recovery testing  
storing a test copy of data used by the first host on the third logical volume, and  
forming a mirror image of data in the third logical volume on the fourth volume.

4. *(Previously Presented)* The method of claim 3, wherein  
data recovery testing comprises:

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simulating a disaster at the first auxiliary host; and  
testing backup of information from the third logical volume to the fourth logical volume,  
and recovery therefrom.

5.     *(Previously Presented)* The method of claim 2, wherein  
executing applications comprises performing data mining,  
establishing on the third volume a data warehouse having a copy of on line transactions  
processing (OLTP) data used by the first host, and  
forming a mirror image of data in the third logical volume on the fourth volume.

6.     *(Previously Presented)* The method of claim 5, wherein  
data mining comprises:  
establishing a data warehouse having a copy of on line transaction processing data at the  
first auxiliary host;  
performing data analyses on the data warehouse information, and  
performing backups and/or recovery of the data warehouse information of the third  
logical volume to the fourth logical volume.

7.     *(Original)* The method of claim 1, further comprising:  
determining if the sync state between the first logical volume and the second logical  
volume is an asynchronous mirror, and if so:

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inhibiting sending of further write data from the first storage subsystem to the second storage subsystem;

recording incoming write data at the first storage subsystem; and

re-synchronizing the first logical volume and the second logical volume after breaking the sync state between the second logical volume and the fourth logical volume.

8. *(Original)* The method of claim 1, wherein  
synchronizing the fourth logical volume with the third logical volume comprises:  
issuing a command to form a mirror with a no copy option; and  
creating a new copy management storage area for the mirror.

9-10. *(Canceled)*

11. *(Currently Amended)* An apparatus, comprising:  
a first means for storing data;  
a first host coupled to the first means for storing data;  
a second means for storing data, being remotable from and a copy of content of the first means for storing data, and being in a sync state with the first means for storing data;  
a third means for storing data, co-located with and a copy of content of the first means for storing data, and being in a sync state with the first means for storing data;  
a fourth means for storing data, co-located with and a copy of content of the second means for storing data, and being in a sync state with the second means for storing data;

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a means for breaking the sync state between the first means for storing data and the third means for storing data and between the second means for storing data and the fourth means for storing data;

a means for synchronizing the fourth means for storing data with the third means for storing data after copying of content of the first means for storing data and the second means for storing data and breaking the sync state; and

means for coupling a first auxiliary host to the third means for storing data; and

means for enabling the first auxiliary host to perform operations on the third means for storing data while the first host continues operations on the first means for storing data and while the first means for storing data and second means for storing data continue in sync state.

12. (Original) The apparatus of claim 11,

further comprising:

a means for creating an atomic split command, the command comprising:

an identity of a first means for storing data to serve as a primary volume; and

an identity of a second means for storing data to serve as a secondary volume.

13. (Original) The apparatus of claim 11,

further comprising:

a means for creating an atomic split command, the command comprising:

a first remote mirror, ORA\_R1, comprised of the first means for storing data and the second means for storing data;

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a second remote mirror, ORA\_R2, comprised of the third means for storing data and the fourth means for storing data;

a first local mirror, ORA\_L, comprised of the first means for storing data and the third means for storing data; and

a second local mirror, ORA\_RL, comprised of the second means for storing data and the fourth means for storing data.

14. *(Currently Amended)* A method, comprising:

establishing a first remote mirror between a first logical unit in a first storage system and a second logical unit in a second storage system, the second storage system being remotable from the first storage system;

enabling a first host to perform operations on the first logical unit;

establishing a first local mirror between the first logical unit and a third logical unit in the first storage system;

establishing a second local mirror between the second logical unit and a fourth logical unit in the second storage system;

splitting the first local mirror and the second local mirror in response to a split command;

after establishing the first local mirror and the second local mirror, establishing a second remote mirror between the third logical unit and the fourth logical unit; and

coupling a first auxiliary host to the third logical unit; and

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enabling the first auxiliary host to perform operations on the third logical unit while the first host continues operations on the first logical unit and while the first remote mirror remains established.

15. *(Original)* The method of claim 14, wherein  
using the logical volumes of the first remote mirror for production processing; and  
using the logical volumes of the second remote mirror for testing.
16. *(Original)* The method of claim 14, wherein  
using the logical volumes of the first remote mirror for on line transaction processing;  
and  
using the logical volumes of the second remote mirror for data mining.
17. *(Original)* The method of claim 14, wherein  
establishing a second remote mirror between the third logical unit and the fourth logical unit comprises:  
issuing a create mirror command with a no copy option; and  
creating a new copy management information store for managing mirroring between the third logical unit and the fourth logical unit.
18. *(Original)* The method of claim 14, wherein  
splitting further comprises:  
determining whether the first remote mirror is asynchronous, and if so:

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copying all pending information to the second storage system.

19. *(Original)* A plurality of remote copy mirrors formed according to the method of claim 1.

20. *(Original)* A plurality of remote copy mirrors formed according to the method of claim 14.

21. *(Currently Amended)* A computer program product, comprising:  
code for establishing a first remote mirror between a first logical unit in a first storage system and a second logical unit in a second storage system, the second storage system being removable from the first storage system;  
code for enabling a first host to perform operations on the first logical unit;  
code for establishing a first local mirror between the first logical unit and a third logical unit in the first storage system;  
code for establishing a second local mirror between the second logical unit and a fourth logical unit in the second storage system;  
code for splitting the first local mirror and the second local mirror in response to a split command;  
code for establishing a second remote mirror between the third logical unit and the fourth logical unit, after establishing the first local mirror and the second local mirror;  
code for coupling a first auxiliary host to the third logical unit;



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code for enabling the first auxiliary host to perform operations on the third logical unit while the first host continues operations on the first logical unit and while the first remote mirror remains established; and

a computer readable storage medium for holding the codes.